CLAIMS

1. A method for detecting orthogonal code CDMA signal, applied to a receiving device in a time-slot CDMA system using orthogonal code, comprising the step of:

5   A. performing channel estimation on received signal with the midamble code, so as to obtain the channel response estimation results of all users in the serving cell, wherein it further comprises the following steps:

B. selecting interference code channels involved in the estimation and estimating the total power of interference to multi-path signals by utilizing the channel response

10   estimation results of all users in the serving cell;

C. performing matched filtering on the received signal with respect to each multi-path signal of each code channel by utilizing the spread spectrum code and the channel response estimation result thereof for the user to be detected, and performing maximum-ratio combining on the matched filtering results of the multi-path signals by

15   utilizing the total power of interference to the multi-path signals, to obtain the optimized matched filtering result and obtain the orthogonal code CDMA signal detection result from the optimized matched filtering result.

2. The method as in claim 1, wherein: in said step B, selecting the interference code channels involved in the estimation is to select all the code channels in the serving

20   cell as the interference code channels involved in the estimation, if it is selected not to perform joint detection; and in said step C, the optimized matched filtering result obtained is taken as the orthogonal code CDMA signal detection result.

3. The method as in claim 1, wherein: in said step B, selecting the interference code channels involved in the estimation is to select the code channels in the serving cell

25   that are not involved in the joint detection as the interference code channels involved in the estimation, if it is selected to perform joint detection; and in said step C, to obtain the orthogonal code CDMA signal detection result from the optimized matched filtering result,

13

step D shall be further carried out, including performing joint detection on the optimized matched filtering result obtained in step C, so as to obtain the joint detection result as the orthogonal code CDMA signal detection result.

4. The method as in claim 3, wherein: the joint detection in said step D further comprises: by using the joint detection method of linear block equalization, performing joint detection with formula $\hat{\mathbf{d}} = (\mathbf{T})^{-1}\mathbf{B}^{*T}\mathbf{e}$ to obtain the joint detection result $\hat{\mathbf{d}}$, where, $\mathbf{B}^{*T}\mathbf{e}$ is the optimized matched filtering result obtained in step C, $\mathbf{e}$ is the received signal inputted, (T) is obtained with formula $\mathbf{T} = \begin{cases} \mathbf{B}^{*T}\mathbf{A} & ZF-BLE \\ \mathbf{B}^{*T}\mathbf{A}+\sigma_n^2 & MMSE-BLE \end{cases}$, where σ_n^2 represents the power of interference.

5. The method as in claim 3, wherein: the joint detection in said step D further comprises: performing joint detection on the optimized matched filtering result obtained in step C with decision feedback and interference cancellation method.

6. The method as in claim 1, 2, or 3, wherein: in said step B, the process that the total power of interference to the multi-path signals is estimated for the interference code channels involved in the estimation by utilizing the channel response estimation results of all users in the serving cell further comprises:

B1. estimating the total power of interference $P_{I,i}$ from the interference code channels at each time delay position with formula $p_{I,i} = \sum_{InterferenceCodeChannel(k)} \left\| h_i^{(k)} \right\|^2$ by utilizing the channel response results $h_i^{(k)}$, where, $k=1,\cdots,K$, representing different channel estimation windows;

B2. on the basis of the characteristic of orthogonal code, estimating the total power of interference I_i from the interference code channels to the signal code channel at each time delay position with formula $I_i = \sum_{j=1}^{W} p_{I,j} - p_{I,i}$, where, $i=1,\cdots,W$, W represents channel estimation window length;

14

B3. estimating the total power of interference $\sigma^2_{total,i}$ to the multi-path signals with formula $\sigma^2_{total,i} = \beta I_i + \sigma^2_{n0}$, where, σ^2_{n0} is the power of interference from adjacent cells and thermal noise, β is the weighting factor for estimation of interference from the interference code channels to the signal code channel at each time delay position.

5   7. The orthogonal code CDMA signal detection method as in claim 6, wherein: said β ranges from 0.5 to 2.

8. The orthogonal code CDMA signal detection method as in claim 7, wherein: said β is taken as 1.

9. The orthogonal code CDMA signal detection method as in claim 1, wherein: in 10   said step C, the process that the maximum ratio combining is performed to obtain the optimized matched filtering result further comprises:

C1. obtaining the weighting factors $w_i^{(k)}$ for the code channels after matched filtering at each time delay position with formula $w_i^{(k)} \propto \dfrac{1}{\sigma^2_{total,i}}$ by utilizing the total power $\sigma^2_{total,i}$ of interference to the multi-path signals;

15   C2. obtaining the optimized matched filtering result $\hat{\mathbf{d}}_{MF}$ with the following formula:

$$\begin{aligned}
\hat{\mathbf{d}}_{MF} &= \mathbf{w}_1 \mathbf{A}_1^{*T} \mathbf{e} + \mathbf{w}_2 \mathbf{A}_2^{*T} \mathbf{e} + \cdots + \mathbf{w}_W \mathbf{A}_W^{*T} \mathbf{e} \\
&= \sum_{i=1}^{W} \mathbf{w}_i \mathbf{A}_i^{*T} \mathbf{e} \\
&= \mathbf{B}^{*T} \mathbf{e}
\end{aligned}$$

where, the matrix of weighting factors $\mathbf{w}_i = diag\left(w_i^{(1)}, w_i^{(2)}, \cdots, w_i^{(K)}\right) \otimes \mathbf{I}$, where $\otimes$ is Kroneck product, $\mathbf{I}$ is a unit matrix; $\mathbf{A}$ is the system response matrix, $\mathbf{B} = \sum_{i=1}^{W} \mathbf{w}_i \mathbf{A}_i$, $\mathbf{e}$ is

20   the received signal inputted.